

EXPERIENCES OF A BUTTERFLY-HUNTER.

Butterfly-Hunting in Many Lands. Notes of a Field Naturalist. By Dr. G. B. Longstaff. To which are added translations of papers by Fritz Müller on the scent-organs of butterflies and moths: with a note by Dr. E. B. Poulton, F.R.S. Pp. xviii+728. With 16 plates, 7 coloured. (London: Longmans, Green and Co., 1912.) Price 21s. net.

IN the handsome volume before us, Dr. Longstaff has brought together an account of his collecting experiences. The first chapter, "Early Reminiscences," describes his work as a collector from 1858 to 1869, chiefly in Britain, and especially during a visit to Rannoch. About 1869 he relinquished collecting, owing to defective sight after the loss of an eye, but from 1903 onward he has been collecting specimens abroad for the benefit of the Oxford Museum, visiting India, Ceylon, China, Japan, Canada, Algeria, South Africa, West Indies, South America, Egypt and the Sudan, New Zealand, and Australia.

Although chiefly a collector of butterflies, insects of all orders attracted more or less of his attention, while Mrs. Longstaff, who frequently accompanied her husband, paid special attention to land and fresh-water Mollusca. He himself made a point of noting the habits of the insects, especially their position at rest, and the odours which many of them emit. The frontispiece shows us the well-known African butterfly, *Eronia cleodora*, on the wing and at rest, and the other coloured plates illustrate not butterflies alone, but numerous interesting insects of all orders, taken by Dr. Longstaff, many of them previously unfigured, and a large proportion actually new to science.

The last chapter is devoted to "Butterfly Bionomics," and deals with such subjects as coloured juices, tenacity of life, mimicry, flight, altitudes, seasonal forms, &c., and the appendix includes a series of twelve important papers by the late Fritz Müller, from various German and Portuguese periodicals, by no means easy of access, even to those acquainted with the original languages. These are translated by Mr. E. A. Elliott, and are illustrated with nine plates. We wish that Porchinsky's beautifully illustrated papers on the colours of larvæ, &c., could also be republished in English from the Russian Entomological Transactions.

Dr. Longstaff's book is addressed chiefly to entomologists, but there are many interesting notes on various subjects scattered through the book, especially his experiences during the earth-

quake in Jamaica on January 14, 1907. There are also some amusing travellers' tales, which may be found scattered here and there through the book. It is exceedingly well printed, and, notwithstanding the enormous amount of technical matter, and the scores of scientific names on almost every page, we have noticed scarcely any misprints; and, indeed, the only point which appears to be an error which we have noticed is the statement that the mongoose was introduced into Jamaica to kill *snakes*. We believe that it was really introduced to kill *rats*, for venomous snakes are unknown in Jamaica, and harmless ones are not remarkably abundant. W. F. K.

SOME TEXT-BOOKS OF CHEMISTRY.

- (1) *A Text-book of Inorganic Chemistry.* By Dr. G. Senter. Pp. xi+583. (London: Methuen and Co., Ltd., 1911.) Price 6s. 6d. (Text-books of Science.)
- (2) *Chemistry: an Elementary Text-book.* By Profs. W. C. Morgan and J. A. Lyman. Pp. xvi+429. (New York: the Macmillan Co.; London: Macmillan and Co., Ltd., 1911.) Price 5s. 6d. net.
- (3) *The Chemistry of the Radio-elements.* By F. Soddy, F.R.S. Pp. v+92+chart. (London: Longmans, Green, and Co., 1911.) Price 2s. 6d. net. (Monographs on Inorganic and Physical Chemistry.)
- (4) *A Text-book of Practical Chemistry for Technical Institutes.* By Dr. A. E. Dunstan and F. B. Thole. Pp. x+335. (London: Methuen and Co., Ltd., 1911.) Price 3s. 6d. (Text-books of Science.)
- (5) *Practical Chemistry for Medical Students.* By Dr. A. C. Cumming. With a preface by Prof. James Walker. Pp. 171. (Edinburgh: James Thin, 1911.)
- (6) *Elementary Experimental Chemistry.* By F. E. Weston. Pp. vii+140. (London: Longmans, Green, and Co., 1911.) Price 2s.
- (7) *Chemistry Note-book.* By E. J. Sumner. Pp. 92. (Burnley: the Cooper Printing Co., Ltd., n.d.) Price 2s.
- (8) *An Experimental Course of Physical Chemistry.* By Dr. J. F. Spencer. Part i., Statical Experiments. Pp. xiv+228. (London: G. Bell and Sons, Ltd., 1911.) Price 3s. 6d.
- (9) *Laboratory Exercises in Physical Chemistry.* By Dr. J. N. Pring. Pp. xiv+163. (Manchester: the University Press, 1911.) Price 4s. net.

(1) UNTIL recently the problems which are now discussed under the heading of "Physical Chemistry" were usually relegated to the preliminary chapters of a text-book of general

chemistry, and only very occasionally touched upon in the later chapters of the book. Such a text-book had undoubted advantages from the point of view of the teacher; the text-book supplied the dry bones of chemistry, and in a course of lectures the flesh and blood could be added without any undue risk of duplicating the teaching derived from the book. But for the solitary student it was an obvious disadvantage that such questions as mass-action and reversible changes should be dealt with in an isolated chapter, and their application to the "daily round" of chemical changes forgotten or neglected. It was to remedy this defect that the book now under review was written. The author has not merely professed the policy of stating facts before theories, but, in welcome contrast with some recent writers, has held to this policy, so that atomic weights are not introduced until chapter x., page 115. Criticism of the book is largely limited to points of detail. Thus the adoption of the old convention that one molecular proportion of a gas occupies "two volumes" appears to the writer to introduce unnecessary confusion, and seems to carry with it some lurking suspicion that the oxygen molecule O_2 occupies two volumes because it contains two atoms, although the volume occupied is precisely the same in the case of the monatomic molecule of mercury. More emphasis might have been placed upon the fact that molecular weights are now referred to $O_2 = 32$ instead of $H_2 = 2$, the statement on p. 109 that "the molecular weight of a gas is double its vapour density referred to hydrogen as unit" being therefore only an approximation and not an exact definition; we have also not noticed on a first reading any statement of the fact that Avogadro's hypothesis is itself only an approximation which becomes accurate only at zero pressure.

In reference to the illustrations, two points have been noticed. The crystal drawings on p. 302 are for the most part correct, but have been printed in curious positions, the upper part of the figure being on the right in Fig. 60, on the left in Fig. 65, and at the bottom of Fig. 63. In Fig. 24 the author has perpetuated the mistake (so often repeated as almost to have become a dogma of the chemical creed) of representing Dumas's experiments on the composition of water as having been made with a Bunsen burner with U-tubes of the modern pattern some six or eight inches long; a reference to the original paper shows that these tubes were a metre in height, and that the beak of the massive copper oxide bulb was also a metre long; on this scale the retort stands of the figure would be 8 ft. high, and the interpolated Bunsen burner about 2 ft. high!

The periodic classification of the elements given on p. 364 shows the elements praseodymium = 140.5 and neodymium = 143.6 as members of the nitrogen and oxygen groups respectively. In view of the extraordinary similarity of these two elements such a separation is very undesirable, and there is every reason for preferring Prof. Armstrong's arrangement, in which the rare earth elements, from lanthanum = 139 to ytterbium = 173, form a vertical column in the boron or aluminium group; precedents for such an arrangement already exist in the clusters Fe, Co, Ni; Ru, Rh, Pd; and Os, Ir, Pt.

These criticisms deal entirely with matters of detail. Turning to more general considerations, it may be noted that the information given is modern and accurate, and that reference is made to a considerable number of observations published during the year 1911, which appears upon the title-page. The style is clear, the book is attractively printed, and the author has undoubtedly succeeded in his endeavour to introduce something of the spirit of physical chemistry into the routine of descriptive chemistry.

(2) The American text-book is in striking contrast to the serious work of our first author. An endeavour has been made

"to bring out the *humanistic* side of the science, to use as far as possible that material which is laden with intense human interest because of its significance to the race."

In so far as this has led the authors to introduce excellent portraits of Dalton, Lavoisier, Faraday, and Kekulé it is to be commended, although Arrhenius, as shown facing p. 260, would scarcely be recognised by his friends. But they proceed to illustrate chemical energy by a picture of a forest being cleared by dynamite, and an obscure photograph of an automobile, enveloped in dust and steam, travelling at 80 miles an hour; rapid oxidation is illustrated by the burning of San Francisco, and slow oxidation by a picture of a bird nesting in a hollow tree; other illustrations show a primeval forest, a coal mine, hydraulic gold-mining in California, and the granite rocks of the Sierra Nevada mountains. The book has evidently been written for American readers, and is not likely to come into general use in England.

(3) Mr. Soddy's book on "The Chemistry of the Radio-elements" is the first of a series of "Monographs on Inorganic and Physical Chemistry," of which ten numbers are already announced. The idea of the series is excellent, and the monographs should appeal to a wider circle and have an even larger circulation than the biochemical monographs already issued by the publishers. Following a general description of radio-activity and radio-active constants, the three "disintegration

series," starting from uranium, thorium, and actinium, are considered, and a note is added in reference to the slight radio-activity of potassium and rubidium. A concise statement of the present position of radio-chemistry is very opportune, and will be welcomed by many readers who are not in a position to master the original literature of the subject.

(4) Messrs. Dunstan and Thole have included in one volume instructions for qualitative analysis, volumetric and gravimetric analysis, gasometry, organic analysis and identification, and physico-chemical determinations; tables of solubility, reagents, atomic weights, logarithms, melting-points and boiling-points are given as appendices. Qualitative analysis is dealt with largely from the ionic point of view, but exception must be taken to the suggestion on p. 12 that H. C. Jones is the originator of the view that the ion is "associated with a variable amount of solvent"; this author's first statement was that the molecules of a salt, and not the ions, are hydrated, and this erroneous view was not withdrawn until the idea of hydrated ions had become generally familiar from the work of Kohlrausch and others. The book does not contain any detailed series of organic preparations, though general instructions are given for acetylation, nitration, preparation of oximes, &c.; but the chapter on organic identification is unusually complete, and forms one of the most valuable features of the book.

(5) Dr. Cumming has compiled a very attractive practical chemistry for medical students, leading up from exercises on solubility, &c., to the examination of organic compounds. The earlier exercises appear to be almost too simple, and it may be doubted whether the separation of salt from sand and the recrystallation of potassium nitrate mixed with a little permanganate are actually carried out by the medical students in the Edinburgh laboratories. In a later edition it would be well to accord to "bunsen" the dignity of a capital letter.

(6) Mr. Weston's book is intended for the use of beginners, and deals with solution, air, water, acids, alkalis, salts, the common gases, and the laws of chemical combination. A feature of the work is the photographic reproduction of actual apparatus; the reproductions are usually good, but a badly-bored cork which makes its first appearance in Fig. 20 shows itself again in the later pictures with the frequency attributed to the "bad penny"; the face reproduced in Fig. 50 would give the impression that a pipette is a worrying instrument to use. The success of a practical course depends almost entirely upon the teacher in charge of the laboratory, and the incidental notes

show that the author has that wider range of knowledge which contributes so much to the interest of the work. Black's work on "fixed air," referred to on p. 83, should be dated 1755 and not 1775.

(7) Historical notes are a feature of the "Chemistry Note-book," whereby Mr. Sumner seeks to supplement the imperfections of a school-boy's "notes." The book is published locally, and is issued in a form which does not lend itself to any modification of the course which the author has adopted in his own school; but the course is a good one, and it may be that other teachers will be content to follow it so closely as to render possible the use of the printed "note-book." Incidental faults are the occasional use of formulæ as abbreviations, a bad habit that needs no encouragement from the teacher of a class of boys, and the slovenly use of the adjective (?) "bunsen." The eleven pages of historical outline at the end of the book are of more general value, and go far to guarantee the qualifications of the author to devise a successful course of elementary chemistry. The list of elements "discovered" by Berzelius is a curious one: there seems to be some confusion between the discovery and the isolation of an element, and it would be easy to dispute the claims of Berzelius to one or other of the two stages in the "discovery" of barium or silicon.

(8) Dr. Spencer has provided a course of experimental work to run side by side with a lecture-course in physical chemistry; the first part, dealing with "statical experiments," is now issued as a separate volume, to be followed by a volume describing the more difficult dynamical experiments. The methods of measuring the mechanical, optical, and thermal properties of substances are illustrated in an ample series of experiments. The methods to be used in correcting a balance and calibrating the weights are described, together with the correction to vacuum standard. It is to be regretted that the correction for latitude is deliberately excluded, and that the vacuum correction is not used systematically in the later experiments. It is not generally realised by chemists that a boiling point under a given pressure of mercury has no accurate significance until a correction has been made for latitude, for height above sea-level, and for the temperature of the mercury of the barometer; the systematic neglect of such corrections is a source of much inaccuracy, and it should be one of the chief objects of a course of experimental work in physical chemistry to get rid of the slovenly habit of making and publishing uncorrected observations. In a later edition the author will perhaps use his opportunity to develop this important feature in a book that is likely to be widely read and used.

(9) Dr. Pring's "Laboratory Exercises" covers a rather narrow range of experiments in physical chemistry, but the book has the advantage that many of the experiments are well worth doing, and are not included in more conventional textbooks. The use of Junker's gas calorimeter, the Mahler-Cook combustion bomb, and the Wanner pyrometer, together with experiments on the charge and discharge of an accumulator and on electrolytic oxidation and reduction, provide a course of real value both as an education in method and as a training in operations of great technical importance. Such a course affords a real inducement to a student to enter the Manchester laboratory, offering as it does exceptional opportunities for technical training on lines widely different from the ordinary course of work in physics or in physical chemistry. T. M. L.

OUR BOOKSHELF.

Prehistoric Thessaly: being some Account of Recent Excavations and Explorations in North-eastern Greece from Lake Kopais to the Borders of Macedonia. By A. J. B. Wace and M. S. Thompson. Pp. xvi+272+vi plates. (Cambridge: University Press, 1912.) Price 18s. net.

MESSRS. WACE AND THOMPSON have opened a new chapter in the history of early civilisation. They have shown that in northern Greece a Neolithic culture, with a peculiar geometric art of its own, held the field contemporaneously with the Bronze Age "Minoan" and "Ægean" culture of southern Greece until the latter had reached its final phase and was entering upon its decline. Bronze was not used by the prehistoric Thessalians until the "Third Late-Minoan Period" of the Ægean culture, when they finally accepted its use from the southerners, not earlier, probably, than *circa* 1300 B.C., and not very long before iron came into general use. This is a most revolutionary discovery, and its effect upon the supposed history of the development of the use of bronze in the rest of Europe cannot yet be gauged. M. Tsountas, the distinguished Greek archæologist, had already discovered important remains of the Neolithic Thessalian culture, with its remarkable polychrome geometric pottery, at Dimini and Sesklo, but he had failed to detect its remarkably late date. He placed it on the usual *a priori* grounds anterior to the Bronze Age Minoan civilisation merely because it was Neolithic. The discovery of Messrs. Wace and Thompson, for which they give chapter and verse in this book, is a much-needed rebuke to a *a priori* arguments in dating prehistoric antiquities.

I regret that considerations of space forbid me to say more of the book, which is a fine one. In it the authors have given us not merely a description of their own work, but a comprehensive monograph upon all the recent excavations in

northern Greece, including those of Tsountas and Sotiriadis, which have inaugurated this new knowledge of early European civilisation.

H. R. HALL.

Gem-stones and their Distinctive Characters. By Dr. G. F. Herbert Smith. Pp. xv+312. (London: Methuen and Co., Ltd., 1912.) Price 6s. net.

THIS compact and well-illustrated manual supplies a want which has long been felt. So many minerals have been found, in recent years, to furnish varieties characterised by brilliant colours, with exquisite transparency and lustre, that jewellers have now a much wider choice than formerly in making selections for their artistic productions. It is unfortunately true that the use of these new gem-stones is greatly hindered by popular prejudices in favour of the materials with an old-established reputation, but a work like the present is calculated to bring home, both to the artists in jewellery and the public served by them, the wealth of unexploited material at command for ornamental purposes.

The early chapters of the book, describing the characters of gem-stones and the methods of discriminating between different species, are characterised by simplicity, clearness, and accuracy. Among the chapters on technology, that which is perhaps of greatest interest deals with the *manufacture* of precious stones. The method by which true rubies are now regularly produced for the market is not only fully described, but is illustrated by a photograph of the apparatus actually employed. The author is, however, able to show what means are available for discriminating between the natural and the artificial gems, and he adds: "At the time the manufactured ruby was a novelty, it fetched as much as 6*l.* a carat, but as soon as it was discovered that it could easily be differentiated from the natural stone, a collapse took place, and the price fell abruptly to 3*s.*, and eventually to 5*s.* and even 1*s.* a carat. . . . The prices of the natural stones, which at first had fallen, have now risen to almost their former level." The wise caution is still insisted on, however, of *Caveat emptor*.

In the descriptive part of the book an attempt at classification of gem-stones is made, which will probably not meet with very general acceptance. The title of "precious-stones" is only allowed to the diamond, ruby, sapphire, and emerald. The large group of "semi-precious" stones includes (with the topaz, spinel, peridot, zircon, opal, &c.) many beautiful substances which up to the present have been little used. The remaining classes are the "ornamental stones" and the "organic products"—pearl, coral, and amber.

An important feature of the work is the number of illustrations given in it. Besides those in the text, there are thirty-three plates, three of which are in colour, giving a fair idea of the appearance of the gems in their natural and cut conditions.

J. W. J.